Canada

Manitoba

CHURCHILL RESEARCH RANGE

FEASIBILITY STUDY

AN

EXECUTIVE SUMMARY

Prepared for:

The Province of Manitoba
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Industrial Technology Branch

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Prepared by:

Spiece Associates inc.
59 Shearwater Bay
Winnipeg, Manitoba
R3T 4V8
204-261-7452

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INTRODUCTION

The Churchill Research Range, Canada's one and only rocket launch facility, was developed out of an international endeavour in geophysical research in 1957, named the International Geophysical Year. The International Space Year forthcoming in 1992, is set to promote multinational cooperation in space into the 21st century. Ironically, 1992 is the same year in which the Churchill Research Range is scheduled to close.

Space technology is vital and directly related to the needs of a large sparsely populated country and cannot be ignored. Elements of space technology vital to Canada must be under Canadian control. A well integrated space program involves activities including: fundamental research; applied research; development of specific hardware and equipment; operation of service facilities, including launch facilities; and processing of data. Canada has all the essential facilities for a coordinated space program, with the exception of launch facilities. Reopening the Churchill Research Range would provide the required launch facilities.

Space research involves many scientific disciplines, including the physical, biological and social sciences. Applications of space science include: communications, meteorology, navigation, monitoring, surveillance, microgravity processing, and atmospheric research including the impact of pollution on our environment. The growing concern for our atmosphere will significantly increase the amount of upper atmosphere research undertaken in the near future, and subsequently the importance of the Churchill launch site.

RECOMMENDATIONS

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The recommendation to the Governments of Canada and Manitoba is to reopen the Churchill Research Range.

RECOMMENDED COURSE OF ACTION

1. Immediately stop and/or prevent all further demolition of the facilities at the Churchill Research Range.

2. Establish a Joint Venture consisting of the Canadian Space Agency and the Manitoba Government to take over the ownership of the Churchill Research Range.

3. Negotiate a collaborative agreement with NASA for the operation of the Churchill Research Range.

4. Initiate a phased redevelopment program as follows:

   1989

   1. Undertake the cosmetic repairs that are required for the facility (paint, plaster board, ceiling tile, office furniture etc.).

   2. Identify and locate the instrumentation and equipment owned by the National Research Council which is still functional and available.

3. Begin returning this equipment to the Range and commence the replacement of obsolete, unavailable, or worn out equipment, thereby returning the range to its 1984 capability.

1990

1. Begin upgrading the range and its equipment so that it is capable of supporting higher altitude sounding rocket missions.

2. Initiate a campaign for the establishment of other space oriented facilities for location on the Churchill Research Range including ground stations for satellites on polar orbits; upper atmosphere and space, academic and research institutions; etc.

1992 - 95

1. Study the feasibility of launching small expendable launch vehicles for heavy payload suborbital and small payload polar low earth orbit missions.

1995 - 98

1. Study the feasibility of establishing a medium to heavy lift expendable launch capability at Churchill.

RECOMMENDED ORGANIZATIONAL STRUCTURE

Incorporate a new joint venture, non profit or other, to assume ownership of the Churchill Research Range. The recommended partners

are the Manitoba Government and the Canadian Space Agency. Manitoba Government representation could logically be undertaken by the Manitoba Research Council. Private sector interests should be accommodated by a board of directors.

Site and equipment maintenance, launch crews, and strategic planning and marketing functions should be subcontracted to specialists on a competitive basis.

OTHER RECOMMENDATIONS

Establish academic and/or research institutes at the Churchill Research Range to take advantage of the scientific instrumentation which will be located there.

SUMMARY AND CONCLUSIONS

The Churchill Research Range, in the same condition when shut down in 1985, would be a world class scientific launch facility in the early 1990's. The Churchill Research Range, because of its position in relation to the Auroral Oval has unique scientific value.

The operation of the Churchill Research Range would support science in Canada and the world. As a result, Manitoba should not have to assume the costs. However, without the dedication and commitment of the Manitoba Government, the Churchill Research Range will not be reactivated.

In the opinion of the consultant, it should be possible to operate the Churchill Research Range so that revenue earned, is sufficient for the cost of operating, maintaining and expanding, once it has been returned to a completely functional state. However, this will require aggressive management and marketing.

- The Manitoba Government MUST open discussions with the Canadian Government NOW to prevent any further demolition of the Churchill Research Range. The demolition planned for the summer of 1989 will significantly reduce the launch capability of the site.
- The Paris Airshow is the gathering of the aerospace industry and its press. The next show takes place in June 1989. As the following show will not take place for two years, representation at the current show must be capitalized upon. Recommendations are:
  - Use the press to announce that the Churchill Research Range has been reopened and is going to stay open.
  - Use the presence of the international scientific community to individually inform them that Canada wants their business.

- As the international launch industry will be present, inform them that Canada is interested in exploring the feasibility of accommodating their vehicles.

Between 1989 and 1995, the return on investment from the Churchill Research Range will not be sufficient to attract the attention of the private sector without very significant government subsidies and performance guarantees.

The initial capital cost may be less than the $4.2 or $2.1 million used in the financial analysis. The estimated cost of the equipment NASA brought to Churchill for the spring 1989 campaign is $4.1 million. The $2.1 million estimate was based on the assumption that range equipment owned by the National Research Council would be utilized and reduce that cost by one-half.

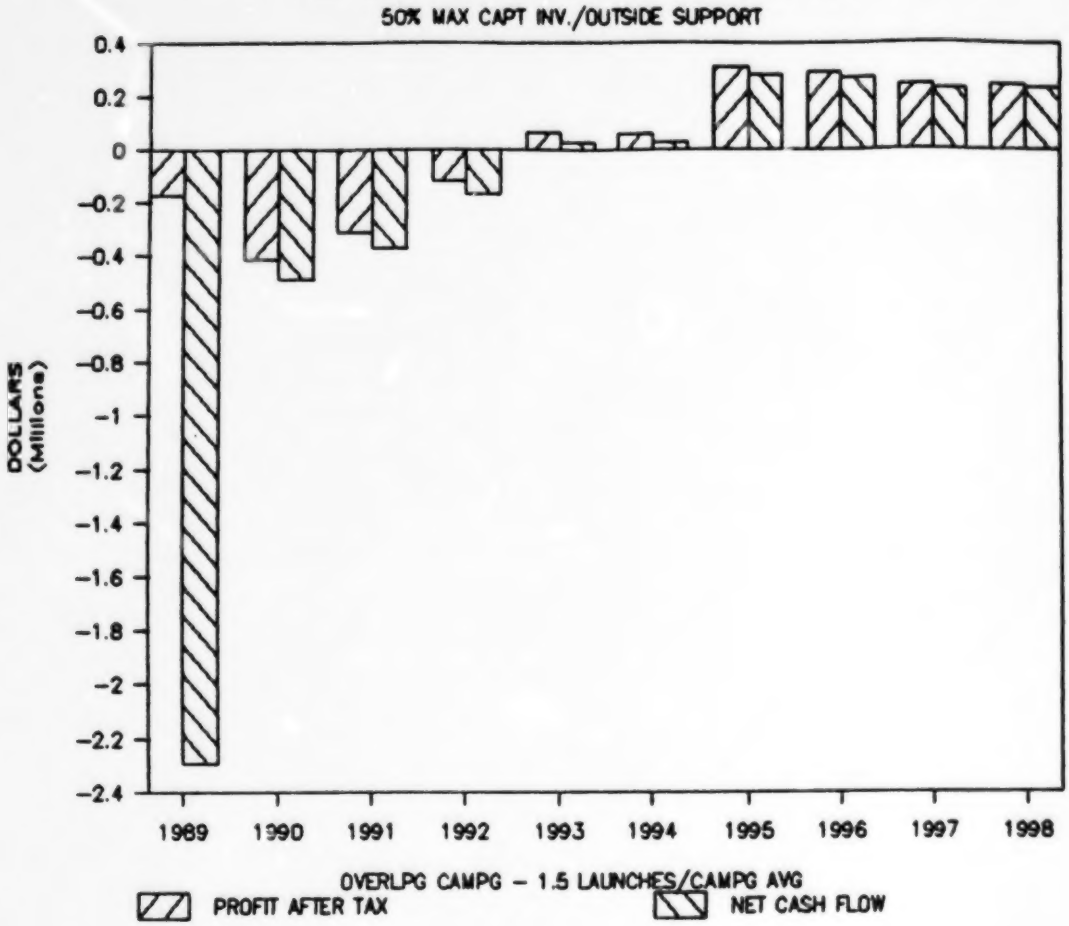
NASA would like to negotiate a long term collaborative arrangement for the Churchill Research Range, providing it was organized so that its longevity would not be impacted by short term political pressures.

The Canadian Space Agency will reconsider Canada's current policy regarding maintenance of a Canadian sounding rocket launch capability.

If the Churchill Research Range is reactivated, the federal Government will not have to incur the cost of dismantling it. There is no reasonably accurate estimate of this cost immediately available. The only estimate obtained was in 1985 totalling $50 million. Since then a significant amount of work has been done and a number of the structures have been turned back to the Manitoba Government.

The cost of launching Canadian sounding rocket experiments from an operational Churchill Research Range could be lower than using ranges outside Canada. Based on the National Research Council 1989 Andoya

REALISTIC SALES PROJECTION



launch, the cost could be reduced by approximately $180,000 per launch. In the opinion of the consultant, in the long term, access to space will be as much a part of the infrastructure as airports. However, like airports, launch facilities may still be government owned and operated.

The Government of Canada should reestablish the Churchill Research Range to:

- provide opportunities for the development of the scientists, astronauts, and others, required to support Canada's aspirations in space,
- support Canada's interest in environmental and atmospheric studies,
- maintain Canadian sovereignty,
- insure that Canadians have control over their own space policy,
- elevate Canada's prestige, and because
- it has unique scientific merit.

Without guaranteed access to space, Canada is dependent on other nations for the fulfillment of its policies involving space. At some future date the lack of a capability to reach space will be devastating to our claim of sovereignty.

To exploit the opportunities of space, an integrated space program is required. The Canadian Space Program adequately provides for developed Canadian space scientists and technology. However, the Space Science Program does not adequately allow for the development of new technology or the training of new scientists.

Canada's space science is in poor health and continues to decline. Canada will not achieve the objectives it has established for its space

program unless it reverses this trend. In 1984 there were more than 25 Canadian scientists in the field and there work was world renown. There are now significantly fewer scientists, all senior persons, many of whom obtained their experience through rocket programs. The current Canadian rocket program, one launch every two years from foreign soil, is inadequate to sustain scientific careers or attract young scientists. Many of our space scientists have sustained their career only as a result of the courtesy of foreign space agencies.

The reopening of the Churchill Research Range and funding for rocket experiments would have a positive impact on Canadian Space science. Such a program could reduce the lead time for experiments from 5 or more years to 12 - 18 months. This would allow Canadian scientists sufficient opportunities to build careers and provide opportunities to attract young people to space science.

Initially, rockets launched at the Churchill Research Range will be sounding rockets. Sounding rocket launches are used for testing equipment and instrumentation destined for space, and research in astronomy, space science, upper atmosphere and microgravity.

The National Research Council is considering expanding its rocket program to one launch per year, but Canadian scientists want at least two per year. NASA's current program is 40 per year and expanding as rapidly as resources will allow. Activity will at least maintain the current level of effort and will likely expand gradually to 80 launches per year.

There is a good deal of commercial interest in microgravity. It is anticipated that microgravity will be a major market for launch services with ground impact capability. The Churchill Research Range is an excellent facility for microgravity work. Canada will not be

able to achieve a world class capability in microgravity without access to a high altitude sounding rocket launching capability.

The Churchill Research Range is an excellent facility. "It is a very easy and comfortable place to do science." The weather at Churchill is comparable to the weather at other northern ranges. The facilities at Churchill allow scientists to work at room temperatures up to the moment of launch. The Churchill Research Range will be a very competitive facility for scientific experiments requiring Churchill's unique position in the auroral oval as well as land recovery of payloads. The azimuth angle through which vehicles can be launched from Churchill is broader than other ranges although the suborbital stage impact area is smaller than ranges where they shoot over the ocean.

In 1986 the Canadian Government mandated that 10 percent of new monies committed to the Canadian Space Program will be spent in the Prairie Provinces. The Churchill Research Range could be such a program.

During the early to mid 1990's it may become possible to launch small payloads into low earth orbits from the Churchill Research Range. This will depend on how rapidly the technology and markets develop. This might require extending the impact area to the North. However, with the new international perspective this should not be a problem.

With the reestablishment of the Churchill Research Range, Canada could offer a complete commercial sounding rocket launch capability. Bristol Aerospace could manufacture the high performance sounding rockets, SED in Saskatoon, Spar Aerospace, David Florida Laboratories and others could manufacture payload systems, while the Canadian Space Agency could provide the experienced range officers. If Bristol Aerospace were to proceed with its plans for the development of a small expendable launch vehicle, Canada could have the complete capability

to launch payloads in the range of 100 - 800 kg into low earth orbit. Such missions might include: search and rescue, earth resources, surveillance, communications, navigation and science.
The Americans recognized that the decision to have the Space Shuttle as its only transportation to space was a mistake. They have revised their space transportation strategy to the "Mixed Fleet" strategy to ensure that American science and satellites have more than one route to space. As part of its mixed fleet, NASA is rebuilding its sounding rocket program to fly small experiments which likely would never get on board the shuttle or satellites. Canada followed the Americans into the Shuttle strategy. However, unlike the Americans, we have not reconsidered our decision.

The market for the Churchill Rocket Range will be principally North America and Japan. Except for site critical missions and collaborative efforts, the Europeans will likely use the ranges in Norway and Sweden. The Japanese have expressed interest in Churchill because they lack the facilities to launch recoverable payloads.

In conclusion, the consultant views the refurbishment of the Churchill Research Range as a necessary and viable project for Canada. This nation needs to gain further independence in space science, and through a joint effort can re-establish the Churchill Research Range to the prestige it gained through the 1960's and 70's.